

Chapter 5 • Exploring Mixtures and Their Separation

PLAY & LEARN

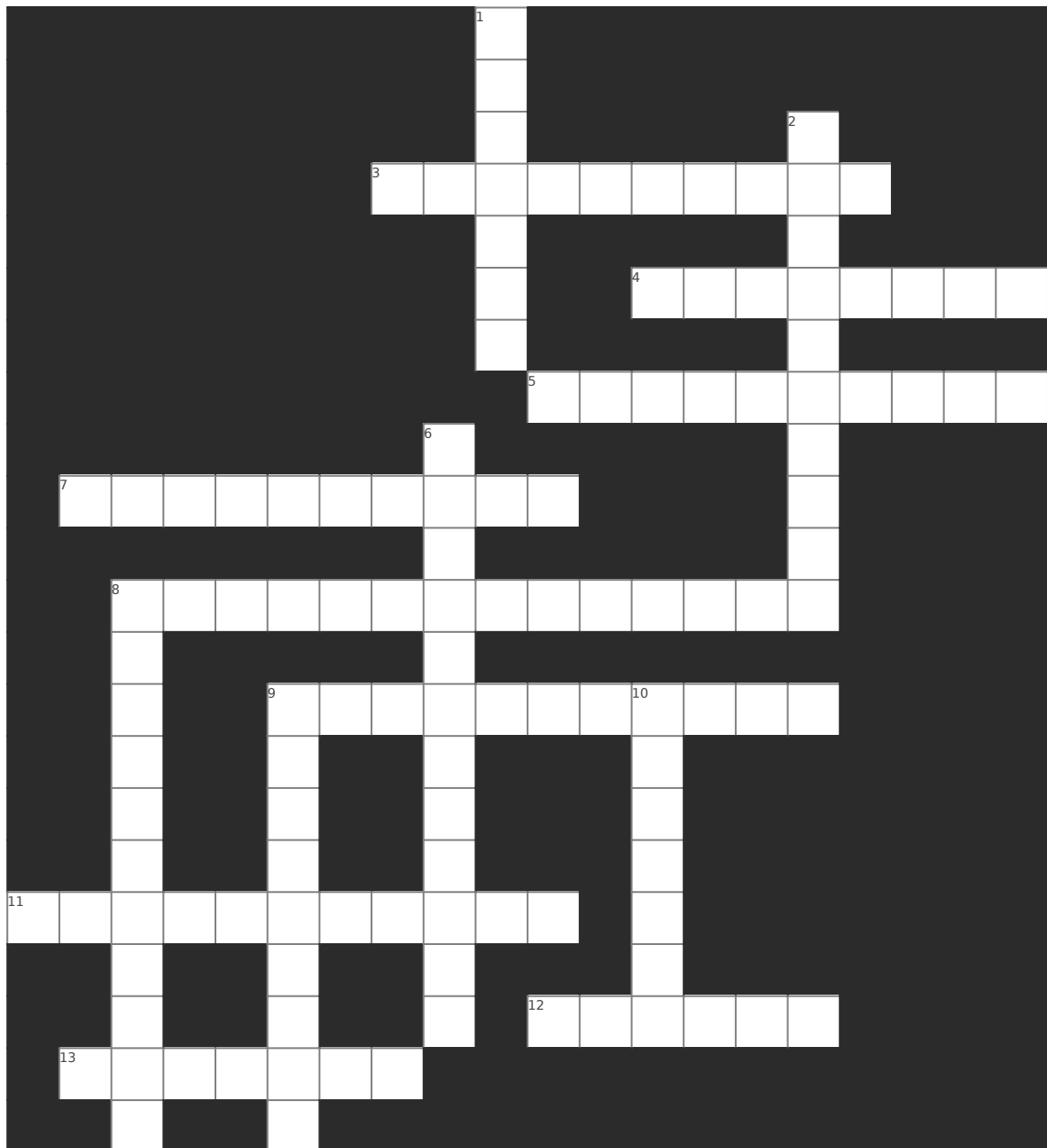
A puzzle workbook — crosswords, word searches, scrambles and quiz games

Print it. Solve it. Race a friend. Answer keys are at the back — no peeking.

#	Puzzle	Play it	Time
1	The Crossword	Solo or pairs	15 min
2	Word Search	Solo — race the clock	10 min
3	Scrambled Terms	Solo	8 min
4	Odd One Out	Teams of 4	10 min
5	Chapter Scrabble	Groups of 3-4	20 min
6	Who Am I? — Clue Cards	Whole class	15 min
7	True or False Sprint	Whole class, standing	6 min
8	Bingo	Whole class	15 min
9	Two Truths and a Lie	Pairs	10 min
10	The Escape Challenge	Teams of 4	25 min

Puzzle 1 · The Crossword

Every answer is a word from this chapter. Fill the white squares — one letter per square.



ACROSS

- 3. separates an insoluble solid from a liquid (10)
- 4. a homogeneous mixture of solute and solvent (8)
- 5. spins a mixture at high speed to separate its components (10)
- 7. a heterogeneous mixture with visibly settling particles (10)
- 8. technique that separates dyes by how far they travel on paper (14)
- 9. solid turning directly into gas (11)
- 11. recovers a dissolved solid by driving off the solvent (11)
- 12. the substance that dissolves in a solution (6)
- 13. the substance that does the dissolving (7)

DOWN

- 1.** a mixture between a solution and a suspension (7)
- 2.** the maximum amount of solute that can dissolve (10)
- 6.** separates liquids by boiling point (12)
- 8.** clumping together of colloidal particles (11)
- 9.** a solution holding the maximum solute it can at that temperature (9)
- 10.** surname of the scientist behind the light-scattering effect in colloids (7)

Puzzle 2 · Word Search

16 terms are hiding in the grid — across, down, diagonally, and backwards. Circle each one, then tick it off the list. Beat 10 minutes and you win.

S	G	Q	R	F	B	M	K	G	N	S	Q	D	R	C
N	U	F	D	O	G	N	M	O	Y	O	H	Y	U	T
O	Q	S	I	I	A	E	I	I	T	L	E	J	O	I
I	K	P	P	X	S	T	C	N	X	U	F	A	E	T
T	P	Q	A	E	A	T	E	O	D	T	R	U	E	Y
U	O	X	O	R	N	V	I	T	L	E	U	A	F	N
L	Q	K	T	A	L	S	O	L	W	L	G	R	D	D
O	X	L	M	O	Z	P	I	J	L	N	O	P	E	A
S	I	I	S	W	P	U	R	O	A	A	Y	I	K	L
F	D	R	P	T	Y	Q	O	P	N	J	T	Y	D	L
E	N	O	I	T	A	R	O	P	A	V	E	I	I	W
Z	L	L	E	N	N	U	F	S	M	O	K	E	O	D
T	D	E	C	A	N	T	A	T	I	O	N	W	N	N
N	Q	N	O	I	T	A	M	I	L	B	U	S	O	E
X	Z	V	V	Y	T	I	L	I	B	U	L	O	S	S

☐ DISTILLATION	☐ SUBLIMATION	☐ EVAPORATION
☐ DECANTATION	☐ SUSPENSION	☐ SOLUBILITY
☐ FILTRATION	☐ SOLUTION	☐ SOLVENT
☐ COLLOID	☐ MIXTURE	☐ TYNDALL
☐ SOLUTE	☐ FUNNEL	☐ PANGA
☐ SMOKE		

Race Rules

- **Solo:** find all the words. Note your time at the top of the page.
- **Pairs:** one partner finds across-and-down words, the other finds diagonals. First pair to complete the list wins.
- **Hard mode:** cover the word list. Find as many chapter terms as you can in 5 minutes.
- **Champion move:** for every word you find, say what it means out loud. No meaning, no point.

Puzzle 3 · Scrambled Terms

Every row is a chapter word with its letters shuffled. Unscramble it. The clue in brackets is your lifeline — try to solve without it first.

#	Scrambled letters	Clue	Your answer
1	R O T H A Y A P O C R M H G	(separates coloured components on paper)	_____
2	L T C U G A N O I A O	(colloidal particles clumping together)	_____
3	N A O L B T S I M U I	(solid turning directly to gas)	_____
4	E U S A D T R T A	(holding the maximum dissolved solute possible)	_____
5	R O E U I N N F T T C A I G	(spinning a mixture at high speed to separate it)	_____
6	A T I D O N T N C A E	(carefully pouring off a liquid, leaving sediment behind)	_____
7	I T C H E R R O P	(the smell of rain on dry earth)	_____
8	S R A E I N T A P G	(____ funnel — used to split two immiscible liquids)	_____

□ Make It a Game

Beat the Bell: the teacher sets a 60-second timer. Every unscrambled word inside the bell = 1 point; a word you can also *define* = 3 points.

Chain Scramble: in a circle, each student scrambles a chapter word for the person on their left. Miss it and you are out. Last student standing wins.

Puzzle 4 · Odd One Out

Three belong together. One does not. Circle the odd one — then write why in one line. The "why" is where the marks are.

#	Which is the odd one out?	Because...
1	Solute · Solvent · Solution · Suspension	_____
2	Filtration · Decantation · Centrifugation · Combustion	_____
3	Smoke · Fog · Milk · Salt water	_____
4	Sugar · Salt · Sand · Sewage water (mixture types)	_____
5	Distillation · Chromatography · Sublimation · Coagulation	_____
6	John Tyndall · Robert Hooke · Camphor · Naphthalene	_____

Puzzle 5 · Chapter Scrabble

Play in groups of 3–4. You have one shared rack of letter tiles. Build only terms from this chapter — no ordinary English words allowed.

Your tile rack — cut these out or write them on paper squares:

A 1	B 3	C 3	D 2	E 1	G 2	H 4
I 1	L 1	M 3	N 1	O 1	P 3	R 1
S 1	T 1	U 1	V 4	X 8	Y 4	Z 10

Scoring:

You did this	Points
Each letter tile used	Its tile value
Word is a term from this chapter	× 2
Word is 8 letters or longer	+ 10 bonus
You can state its meaning correctly	+ 5
You can connect it to a real-life example	+ 3
Word is <i>not</i> in this chapter (challenged and lost)	– 5

□ How a Round Works

1. Player builds a word from the rack and lays it down.
2. Any opponent may **challenge** within 10 seconds: "That's not in this chapter."
3. Open the textbook. If the challenger is right, the word is removed and the builder loses 5 points. If the challenger is wrong, the *challenger* loses 5 points.
4. Builder states the meaning to claim the +5 bonus. The group votes on whether it was correct.
5. Play 6 rounds. Highest total wins.

□ Target Words (worth the most — do not show your opponents)

CHROMATOGRAPHY · SUBLIMATION · CENTRIFUGATION · COAGULATION ·
DISTILLATION · SOLUBILITY · SATURATED · SUSPENSION

Puzzle 6 · Who Am I? — Clue Cards

Cut along the lines. One student draws a card and reads only the first clue aloud; the class guesses. Wrong guess? Read clue 2. Fewer clues used = more points.

CARD 1 ① I am a homogeneous mixture. ② I have a solute dissolved in a solvent. ③ I am a solution.	CARD 2 ① I am the smaller-quantity substance in a solution. ② Sugar in tea is an example of me. ③ I am the solute.
CARD 3 ① I am the larger-quantity substance in a solution. ② Water is usually me. ③ I am the solvent.	CARD 4 ① I am between a true solution and a suspension. ② Milk and fog are examples of me. ③ I am a colloid.
CARD 5 ① My particles are large enough to settle and scatter light. ② Muddy water is an example of me. ③ I am a suspension.	CARD 6 ① I turn a solid directly into a gas. ② Camphor and naphthalene undergo me. ③ I am sublimation.
CARD 7 ① I separate substances by their different boiling points. ② Crude oil is refined using me. ③ I am distillation.	CARD 8 ① I separate coloured components based on how far they travel. ② I am used to separate leaf pigments. ③ I am chromatography.
CARD 9 ① I spin very fast to separate components by density. ② A paperfuge is my low-cost cousin. ③ I am a centrifuge.	CARD 10 ① I am the maximum amount of solute a solvent can hold. ② I depend on temperature. ③ I am solubility.
CARD 11 ① I studied how colloidal particles scatter light. ② My name is attached to that scattering effect. ③ I am John Tyndall.	CARD 12 ① I am careful pouring, leaving sediment behind. ② I need no equipment beyond patience. ③ I am decantation.

Scoring: guessed after clue ① = **5 points** · after ② = **3 points** · after ③ = **1 point**

Puzzle 7 · True or False Sprint

Everyone stands. Teacher reads a statement. True → stay standing. False → sit down. Get it wrong and you are out. Last student standing wins.

#	Statement	Your call
1	A solution is a heterogeneous mixture.	☐ True ☐ False
2	Salt is the solute when dissolved in water.	☐ True ☐ False
3	A colloid's particles are large enough to settle out on standing.	☐ True ☐ False
4	Milk is an example of a colloid.	☐ True ☐ False
5	Sublimation turns a solid directly into a gas.	☐ True ☐ False
6	Distillation separates mixtures based on boiling point.	☐ True ☐ False
7	Chromatography can separate different coloured pigments.	☐ True ☐ False
8	A saturated solution can dissolve unlimited additional solute.	☐ True ☐ False
9	The Tyndall effect explains why colloids scatter light.	☐ True ☐ False
10	Filtration can separate two miscible liquids.	☐ True ☐ False
11	A separating funnel is used for two immiscible liquids.	☐ True ☐ False
12	Centrifugation separates components by spinning them at high speed.	☐ True ☐ False
13	Coagulation is the clumping together of colloidal particles.	☐ True ☐ False
14	Petrichor is the name for the smell of rain on dry soil.	☐ True ☐ False

Puzzle 8 · Bingo

Each student fills the empty grid below with any 16 words from the word bank — in any order, one per box. The teacher then reads out meanings, not names. Cross a box only when its meaning is called. First to a full row, column or diagonal shouts BINGO.

Word bank — choose any 16:

Solution	Solute	Solvent	Colloid
Suspension	Sublimation	Solubility	Distillation
Chromatography	Filtration	Evaporation	Centrifugation
Decantation	Coagulation	Tyndall effect	Saturated

Your bingo card:

□ **Caller's List (teacher only — read the meaning, never the name)**

① "I am a homogeneous mixture of solute and solvent." ② "I am the substance that dissolves." ③ "I am the substance doing the dissolving." ④ "I am a mixture between a solution and a suspension." ⑤ "My particles are large enough to settle and scatter light." ⑥ "I turn a solid directly into a gas." ⑦ "I am the maximum amount of solute that can dissolve." ⑧ "I separate liquids by their different boiling points." ⑨ "I separate coloured components on paper." ⑩ "I separate an insoluble solid from a liquid." □ "I recover a dissolved solid by driving off the solvent." □ "I spin a mixture at high speed to separate it." □ "I am careful pouring, leaving sediment behind." □ "I am the clumping of colloidal particles."

Puzzle 9 · Two Truths and a Lie

Each set has three statements. Two are true, one is a lie. Circle the lie — and correct it in one line.

Set 1

- (a) A solution is always liquid.
- (b) A solution is always homogeneous.
- (c) Air is a solution of gases.

The lie is _____. Corrected: _____

Set 2

- (a) Colloid particles settle on standing.
- (b) Colloid particles scatter light (Tyndall effect).
- (c) Milk is a colloid.

The lie is _____. Corrected: _____

Set 3

- (a) Distillation separates by boiling point.
- (b) Chromatography separates by boiling point.
- (c) Chromatography can separate leaf pigments.

The lie is _____. Corrected: _____

Set 4

- (a) Sublimation converts solid to liquid.
- (b) Sublimation converts solid directly to gas.
- (c) Naphthalene balls sublime over time.

The lie is _____. Corrected: _____

Puzzle 10 • The Escape Challenge

Solve all five gates. Each gives you one digit. Collect all five to unlock the exit code.

□ GATE 1 — The Solution Gate

How many main components does a solution have (solute + solvent)? Use that number.

Digit: □

□ GATE 2 — The Colloid Gate

Count the letters in TYNDALL.

Digit: □

□ GATE 3 — The Separation Gate

How many separation techniques are named in this chapter's crossword (filtration, distillation, chromatography, centrifuge, sublimation, evaporation, decantation)? Take the first digit.

Digit: □

□ GATE 4 — The Saturation Gate

Count the letters in SATURATED.

Digit: □

□ GATE 5 — The Mixture Gate

How many broad mixture types are named (solution, colloid, suspension)? Use that number.

Digit: □

EXIT CODE: □ □ □ □ □

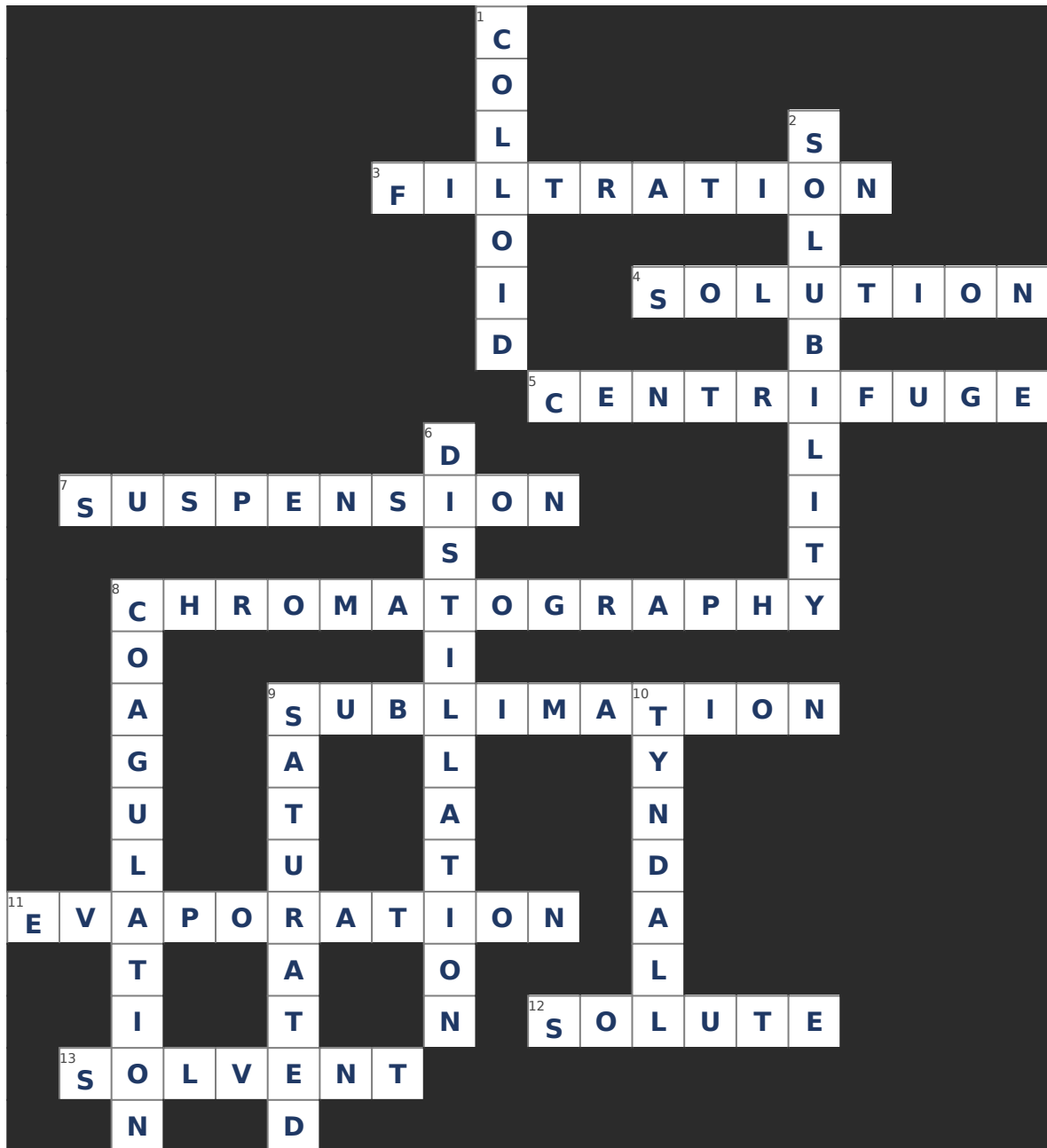
□ Teacher's note

Hide the gate cards around the classroom. Teams rotate every 4 minutes. First team to reach the door with the correct code escapes. Losing teams try again next period.

Answer Keys

Teachers and self-checkers only. Solve first — the puzzle is the point.

Puzzle 1 · Crossword — Solved Grid



Across: 3 FILTRATION · 4 SOLUTION · 5 CENTRIFUGE · 7 SUSPENSION · 8 CHROMATOGRAPHY · 9 SATURATED · 11 EVAPORATION · 12 SOLUTE · 13 SOLVENT

Down: 1 COLLOID · 2 SOLUBILITY · 6 DISTILLATION · 8 COAGULATION · 9 SATURATED · 10 TYNDALL

Puzzle 2 · Word Search — Solved Grid

S	G	Q	R	F	B	M	K	G	N	S	Q	D	R	C
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

N	U	F	D	O	G	N	M	O	Y	O	H	Y	U	T
O	Q	S	I	I	A	E	I	I	T	L	E	J	O	I
I	K	P	P	X	S	T	C	N	X	U	F	A	E	T
T	P	Q	A	E	A	T	E	O	D	T	R	U	E	Y
U	O	X	O	R	N	V	I	T	L	E	U	A	F	N
L	Q	K	T	A	L	S	O	L	W	L	G	R	D	D
O	X	L	M	O	Z	P	I	J	L	N	O	P	E	A
S	I	I	S	W	P	U	R	O	A	A	Y	I	K	L
F	D	R	P	T	Y	Q	O	P	N	J	T	Y	D	L
E	N	O	I	T	A	R	O	P	A	V	E	I	I	W
Z	L	L	E	N	N	U	F	S	M	O	K	E	O	D
T	D	E	C	A	N	T	A	T	I	O	N	W	N	N
N	Q	N	O	I	T	A	M	I	L	B	U	S	O	E
X	Z	V	V	Y	T	I	L	I	B	U	L	O	S	S

Puzzle 3 · Scrambled Terms

1. CHROMATOGRAPHY · 2. COAGULATION · 3. SUBLIMATION · 4. SATURATED · 5. CENTRIFUGATION · 6. DECANTATION · 7. PETRICHOR · 8. SEPARATING

Puzzle 4 · Odd One Out

#	Odd one	Because
1	Suspension	the other three describe or make up a true solution; suspension is a separate mixture type
2	Combustion	the other three are physical separation techniques; combustion is a chemical reaction
3	Salt water	the other three are colloids/suspensions that scatter light; salt water is a true solution
4	Sand	sugar and salt dissolve to form true solutions; sand does not dissolve at all
5	Coagulation	the other three are separation techniques; coagulation is a colloid-clumping process
6	Robert Hooke	the other three relate to this chapter (Tyndall effect, sublimating solids); Hooke belongs to Ch.2

Puzzle 7 · True or False Sprint

1-F · 2-T · 3-F · 4-T · 5-T · 6-T · 7-T · 8-F · 9-T · 10-F · 11-T · 12-T · 13-T · 14-T

Puzzle 9 · Two Truths and a Lie

Set	The lie	Correction
1	a	Solutions can be solid (alloys) or gas (air), not only liquid.
2	a	Colloid particles do NOT settle on standing — that is what distinguishes them from suspensions.
3	b	Chromatography separates by how far components travel on paper, not by boiling point.
4	a	Sublimation skips the liquid stage entirely — solid goes straight to gas.

Puzzle 10 · The Escape Challenge

EXIT CODE: 2 · 7 · 7 · 9 · 3

(Answer: 2) (Answer: 7) (Answer: 7) (Answer: 9) (Answer: 3)

Now go separate a real mixture at home — sugar and sand make a great start. ☐☐